IN THE CLAIMS

Claims 1-28. (Cancelled).

29. (New) A machine-implemented method for multiplying a matrix [A] by a matrix of inputs [X] to obtain a matrix of outputs [Y], the method comprising:

forming [A] as a matrix of predetermined values and multiplication operations, wherein the multiplication operations are selectively positioned into pairs within [A] to reduce the number of the multiplication operations upon factorization of [A];

factoring [A] into a butterfly matrix [B], a shuffle matrix [S], and a multiplication matrix [M];

grouping a set of values together within [M] for simultaneous execution by a processor instruction; and

simultaneously executing multiplication operations on the grouped set of values using a Single Instruction Multiple Data (SIMD) instruction.

30. (New) The machine-implemented method of claim 29, wherein the SIMD instruction is a Packed Multiply and Add (PMADDWD) instruction.

31. (New) The machine-implemented method of 30, wherein values within [B] and [S] are integers selected from the group consisting of 1, 0 and –1.

32. (New) The machine-implemented method of claim 31, wherein [A] is a 4-point Discrete Cosine Transform (DCT) transformation matrix, [X] represents a time domain of a video signal, and [Y] represents a frequency domain of the video signal.

33. (New) The machine-implemented method of claim 32, wherein the multiplication matrix [M] is

$$\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 & 0 \\ \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} & 0 & 0 \\ 0 & 0 & \cos(\frac{3\pi}{8}) & \cos(\frac{\pi}{8}) \\ 0 & 0 & -\cos(\frac{\pi}{8}) & \cos(\frac{3\pi}{8}) \end{bmatrix},$$

and wherein the grouped set of values are $\begin{matrix} \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{matrix}$ and $\begin{matrix} \frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} \end{matrix}$.

34. (New) A machine-readable medium having instructions to cause a machine to perform a machine-implemented method for multiplying a matrix [A] by a matrix of inputs [X] to obtain a matrix of outputs [Y], the method comprising:

forming [A] as a matrix of predetermined values and multiplication operations, wherein the multiplication operations are selectively positioned into pairs within [A] to reduce the number of the multiplication operations upon factorization of [A];

factoring [A] into a butterfly matrix [B], a shuffle matrix [S], and a multiplication matrix [M];

grouping a set of values together within [M] for simultaneous execution by a processor instruction; and

simultaneously executing multiplication operations on the grouped set of values using a Single Instruction Multiple Data (SIMD) instruction.

35. (New) The machine-readable medium of claim 34, wherein the SIMD instruction is a Packed Multiply and Add (PMADDWD) instruction.

36. (New) The machine-readable medium of claim 35, wherein values within [B] and [S] are integers selected from the group consisting of 1, 0 and –1.

37. (New) The machine-readable medium of claim 36, wherein [A] is a 4-point Discrete Cosine Transform (DCT) transformation matrix, [X] represents a time domain of a video signal, and [Y] represents a frequency domain of the video signal.

38. (New) The machine-readable medium of claim 37, wherein the multiplication matrix [M] is

$$\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 & 0 \\ \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} & 0 & 0 \\ 0 & 0 & \cos(\frac{3\pi}{8}) & \cos(\frac{\pi}{8}) \\ 0 & 0 & -\cos(\frac{\pi}{8}) & \cos(\frac{3\pi}{8}) \end{bmatrix},$$

and wherein the grouped set of values are $\begin{matrix} \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{matrix}$ and $\begin{matrix} \frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} \end{matrix}$.

39. (New) A system comprising:

a processing unit coupled to a memory through a bus; and

a process for multiplying a matrix [A] by a matrix of inputs [X] to obtain a matrix of outputs [Y], the process executed from the memory by the processing unit to cause the processing unit to:

form [A] as a matrix of predetermined values and multiplication operations, wherein the multiplication operations are selectively positioned into pairs within [A] to reduce the number of the multiplication operations upon factorization of [A];

factor [A] into a butterfly matrix [B], a shuffle matrix [S], and a multiplication matrix [M];

group a set of values together within [M] for simultaneous execution by a processor instruction; and

simultaneously execute multiplication operations on the grouped set of values using a Single Instruction Multiple Data (SIMD) instruction.

40. (New) The system of claim 39, wherein the SIMD instruction is a Packed Multiply and Add (PMADDWD) instruction.

41. (New) The system of claim 40, wherein values within [B] and [S] are integers selected from the group consisting of 1, 0 and –1.

42. (New) The system of claim 41, wherein [A] is a 4-point Discrete Cosine Transform (DCT) transformation matrix, [X] represents a time domain of a video signal, and [Y] represents a frequency domain of the video signal.

43. (New) The system of claim 42, wherein the multiplication matrix [M] is

$$\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 & 0 \\ \frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} & 0 & 0 \\ 0 & 0 & \cos(\frac{3\pi}{8}) & \cos(\frac{\pi}{8}) \\ 0 & 0 & -\cos(\frac{\pi}{8}) & \cos(\frac{3\pi}{8}) \end{bmatrix},$$

and wherein the grouped set of values are $\begin{matrix} \frac{1}{\sqrt{2}} \\ \frac{1}{\sqrt{2}} \end{matrix}$ and $\begin{matrix} \frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} \end{matrix}$.